

Effects of calcination temperature on microstructure and superconducting properties of Y123 ceramic prepared using thermal treatment method

ABSTRACT

Thermal treatment method was employed to produce $\text{YBa}_2\text{Cu}_3\text{O}_x$ superconductor ceramic. The effects of calcination temperature at 850 °C, set A, and 910 °C, set B, for 24 h followed by sintering at 930, 950 and 980 °C, were investigated using X-ray diffraction (XRD), scanning electron microscope (SEM) and four point probe measurement. The orthorhombic structure appears after calcination at 850 and 910 °C beside small amount of impurity phase such as Y_2BaCuO_5 (Y211). The samples exhibited metallic behaviour and the critical temperature, $T_{C(R=0)}$, increases with increasing sintering temperature. The $T_{C(R=0)}$ of samples calcined at 910 °C is higher than that of sample calcined at 850 °C. The highest $T_{C(R=0)}$, 87 K, was found for sample sintered at 980 °C of set B. An increase in grain size and homogeneity was observed as the sintering temperature increases. The set B sample sintered at 980 °C showed compact grains, which could result in the highest $T_{C(R=0)}$.

Keyword: $\text{YBa}_2\text{Cu}_3\text{O}_x$; Thermal treatment; X-ray diffraction; Orthorhombic; Critical temperature